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ABSTRACT

This study was undertaken to determine the degree of factorial invariance that exists in a battery of predictor variables commonly used in the selection of applicants for dental school. The following variables were used in the analyses performed: 13 subscores from the Dental Aptitude Test Battery, Overall QPA, Required Courses QPA, years of undergraduate education, and a derived composite score. Principal components analysis was performed on the data for three separate classes. With relative consistency, the same three factors appeared in each of the analyses, and were labeled as follows: Science Aptitude, Prior Achievement, Manual Aptitude, and General Ability. (Author)

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Principal Components Analyses of Predictor Variables in Dental Education

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Principal Components Analyses of Predictor Variables in Dental Education

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Horst (1965) has defined two of the purposes of factor analysis to be the reduction in dimensionality of a set of measures and the achievement of invariance with respect to different samples using the same set of measures. With these purposes in mind, this study was undertaken in an effort to determine the degree of factorial stability that exists in a battery of predictor variables commonly used in the selection of students by dental schools. The variables used in this study consisted of the following:

1) Required QPA
2) Overall QPA
3) Degree (years of college)
4) "Old" Total Weighted Score
5) Academic Average
6) Manual Average
7) Quantitative Reasoning
8) Verbal Reasoning
9) Mental Level
10) Reading Comprehension
11) Biology
12) Chemistry
13) Factual Science
14) Science Application
15) Total Science
16) Spatial Relations
17) Chalk Carving
*18) "New" Total Weighted Score

*Only the Class of 1973 has scores for the entire 18 variable battery. Since "New" Total Weighted Score (TWS) replaced "Old" Total Weighted Score in the admission procedures at the University of Pittsburgh, the Class of 1972 has only an "Old" TWS while the Classes of 1974 and 1975 have only the "New" TWS.

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Variables 1 and 2 are measures of undergraduate QPA with Required QPA being computed from those courses which were formerly required for admission to dental schools by the American Association of Dental Schools. The required courses consisted of Inorganic and Organic Chemistry, Biology, Physics and English. Prerequisite academic experience is now established individually by each dental school.

Since the completion of a bachelor's degree is not a requirement for admission to dental school, Variable #3, "Degree" (years of college) was determined as follows: 2, 3, and 4 respectively for the number of undergraduate years, 5 for completion of a bachelor's degree and 6 for completion of a Master's degree.

Variables 5-17 consist of the various scores reported by the Dental Aptitude Test Battery (DAT). As has been reported previously (Zullo, 1971), these scores are not all independent of one another. For example, the Manual Average score (Variable #6) is the average of the Space Relations and the Chalk Carving scores. For these analyses, it was decided to retain all scores that are reported from DAT regardless of their degree of independence.

Variables 4 and 18, "Old" and "New" Total Weighted Score (TWS) respectively, are weighted composites derived for admission purposes at the University of Pittsburgh School of Dental Medicine. The "New" TWS differs from the "Old" in that more weight is given to measures of QPA and years of undergraduate education.

Subjects

Subjects consisted of all students from the graduating classes of 1972, 1973, 1974 and 1975 at the University of Pittsburgh School of Dental Medicine for whom complete sets of scores were available. The number of subjects in each of the four groups is presented in Table 1.

TABLE 1

Year of Anticipated Graduation	N
1972	114
1973	111
1974	122
1975	124

Data were subjected to principal components using the BMD03M program analysis. As was previously noted, only the Class of 1973 had scores for all 18 variables--the other three classes having scores for 17 variables. The intercorrelation matrices for the four groups are presented in Tables 2-5.

Previous experience has indicated that interpretation of data such as these is enhanced by rotation of the principal factor matrix. The Varimax method of analytical method of rotation was used and four factors were retained for rotation and interpretation for the four groups. The rotated factor patterns for the four classes are shown in Tables 6-9.

The selection of four factors was based on the following criteria:

1) three of the groups (classes of 1972, 1973 and 1974) had only four eigenvalues greater than 1.0
2) at least 74 percent of the variance of the battery was accounted for by four factors for all groups
3) for purposes of comparison of factor patterns, the same number of factors for each group would be desirable.

Figure 1 is presented in an effort to consolidate the findings and aid in the interpretation of the results. As can be noted in Tables 6-9 and summarized in Figure 1, the four rotated factors and the variables that load on them are quite similar for the four groups.

Discussion

Factor I, Science Aptitude, was defined by the same five subtest scores of the DAT for all four groups. As was noted earlier, not all scores on the DAT are independent of one another and Factor I is a clear example of this.

Biology, Chemistry, Factual Science and Science Application are all part scores derived for the Total Science score. Academic Average is a composite score that represents an average of the Quantitative Reasoning, Verbal Reasoning, Reading Comprehension, Biology and Chemistry scores. It is also interesting to note that for all four classes, the variable with the highest factor loading was the Total Science score.

The interpretation of Factor II as Achievement is based upon the heavy weighting of previous academic achievement, i.e., Required and Overall QPA. The loading of Total Weighted score, whether "Old" or "New," can be explained by the fact that this composite measure is heavily weighted on undergraduate QPA. Of particular interest in Factor II is the negative loading of "Degree" with measures of QPA. The interpretation of this might be quite simple--the longer one stays in school, the lower his QPA tends to be. When one examines the intercorrelation matrices (Table 2-5), it is interesting to note that "Degree" correlates either negatively over quite low when positive with most of the other variables in the study. In all groups, Required QPA had the largest factor loading on Achievement.

Factor III, Manual Aptitude, is rather self-descriptive. It is defined by the Space Relations and Chalk Carving scores along with Manual Average which, as has been previously described, is an average of Space Relations and Chalk Carving scores. In all four groups, the variable withthe largest factor loading was Manual Average.

Only Factor IV, General Ability, differs somewhat on the variables which define it for the four groups. For the Class of 1973 only, Science Application was also found to load on Factor IV. The variable with the highest factor loading was Mental Level which is defined as a combination of the Quantitative Reasoning and Verbal Reasoning raw scores. In reality this is the Cooperative School and College Ability Tests total score which is generally considered as a test of general ability.

Only the Class of 1975 was found to have five factors with eigenvalues greater than 1.0. When five factors were rotated, the only change in factor structure of the rotated matrix was that the Reading Comprehension score loaded solely on this fifth factor and not on the General Ability factor.

Conclusion

The stated aim of this study was to determine the degree of factorial stability that exists in a battery of predictor variables used in the selection of applicants to dental school. While no analytical method was used to measure stability, visual observation of the rotated factor patterns would tend to indicate a fair degree of congruence among the four classes.

The implications of these findings are primarily in the area of prediction and selection. A next step could be to select those four variables, Total Science, Required QPA, Manual Average and Mental Level, that load highest on their respective factors and use them in a multiple regression study. Stability of best predictors and cross validation studies could then be conducted with the data at hand. Another proposed study is to use the four factor scores instead of raw scores in multiple regression studies. Comparison studies could be conducted to determine if prediction is improved by using factor scores as opposed to the raw scores of the variables having the highest factor loading. Also of major interest in studying the use of factor scores in prediction is to lessen the phenomenon of bouncing betas, i.e., the best predictor varying from one

class to another. Although this was proposed in an earlier publication (Zullo, 1971), it has yet to be implemented.

TABLE 2

Intercorrelation Matrix

Class of 1972

3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
68	-0.57	0.03	-0.10	0.07	-0.21	-0.10	0.04	0.05	0.21	0.01	0.24	0.14	-0.09	-0.07
65	-0.44	0.01	-0.08	0.00	-0.16	-0.10	-0.01	0.10	0.12	-0.01	0.23	0.12	-0.08	-0.05
00	-0.30	0.37	0.28	0.17	0.06	0.17	0.19	0.30	0.43	0.22	0.50	0.43	0.22	0.22
	1.00	-0.17	-0.04	-0.17	-0.09	-0.16	-0.12	-0.06	-0.19	-0.07	-0.19	-0.15	-0.01	-0.04
		1.00	0.15	0.54	0.64	0.72	0.68	0.57	0.70	0.58	0.70	0.75	0.32	-0.05
			1.00	0.17	0.00	0.13	0.11	0.04	0.17	-0.01	0.18	0.10	0.70	0.76
				1.00	0.28	0.74	0.23	-0.04	0.35	0.04	0.29	0.18	0.33	-0.05
					1.00	0.81	0.39	0.29	0.24	0.34	0.24	0.32	0.14	-0.09
						1.00	0.37	0.15	0.36	0.22	0.33	0.31	0.30	-0.05
							1.00	0.30	0.31	0.22	0.40	0.38	0.31	-0.08
								1.00	0.37	0.73	0.65	0.81	0.03	0.07
									1.00	0.59	0.76	0.81	0.21	0.05
										1.00	0.42	0.80	-0.04	0.06
											1.00	0.84	0.26	0.04
												1.00	0.13	0.05
													1.00	0.12
														1.00

TABLE 2

Intercorrelation Matrix

Class of 1972

Test	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Req. QPA	1.00	0.82	0.68	-0.57	0.03	-0.10	0.07	-0.21	-0.10	0.04	0.05	0.21	0.01	0.24
2. Over. QPA		1.00	0.65	-0.44	0.01	-0.08	0.00	-0.16	-0.10	-0.01	0.10	0.12	-0.01	0.23
3. Degree			1.00	-0.30	0.37	0.28	0.17	0.06	0.17	0.19	0.30	0.43	0.22	0.50
4. Old TWS				1.00	-0.17	-0.04	-0.17	-0.09	-0.16	-0.12	-0.06	-0.19	-0.07	-0.19
5. Acad. Avg.					1.00	0.15	0.54	0.64	0.72	0.68	0.57	0.70	0.58	0.70
6. Man. Avg.						1.00	0.17	0.00	0.13	0.11	0.04	0.17	-0.01	0.18
7. Quant. Reas.							1.00	0.28	0.74	0.23	-0.04	0.35	0.04	0.29
8. Verb. Reas.								1.00	0.81	0.39	0.29	0.24	0.34	0.24
9. Ment. Lev.									1.00	0.37	0.15	0.36	0.22	0.33
10. Read. Comp.										1.00	0.30	0.31	0.22	0.40
11. Biology											1.00	0.37	0.73	0.65
12. Chemistry												1.00	0.59	0.76
13. Fac. Sci.													1.00	0.42
14. Sci. App.														1.00
15. Total Sci.														
16. Sp. Rel.														
17. Chalk														

TABLE 3

Intercorrelation Matrix

Class of 1973

4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
.42	0.00	-0.16	-0.05	-0.08	-0.03	-0.02	-0.08	0.17	0.10	0.01	0.07	-0.08	-0.17	0.67
.42	0.03	-0.16	-0.01	-0.07	0.00	0.00	0.00	0.17	0.14	0.05	0.12	-0.06	-0.17	0.66
.16	0.39	0.24	0.22	0.27	0.35	0.25	0.22	0.45	0.37	0.32	0.41	0.31	0.02	0.68
.00	-0.02	-0.07	-0.14	0.12	-0.05	-0.02	0.05	-0.03	0.02	-0.01	0.00	-0.05	-0.01	-0.19
	1.00	0.09	0.64	0.73	0.83	0.78	0 59	0.69	0.59	0.76	0.81	0.28	-0.15	0.10
		1.00	0.26	0.06	0.20	0.04	-0.05	0.04	-0.02	-0.02	-0.04	0.71	0.67	-0.10
			1.00	0.37	0.78	0.42	0.12	0.40	0.15	0.40	0.33	0.40	-0.04	0.05
				1.00	0.83	0.52	0.42	0.35	0.39	0.42	0.50	0.21	-0.12	0.07
					1.00	0.58	0.34	0.47	0.35	0.50	0.51	0.37	-0.09	0.10
						1.00	0.37	0.45	0.39	0.54	0.53	0.16	-0.07	0.06
							1.00	0.26	0.72	0.62	0.79	0.08	-0.17	-0.04
								1.00	0.53	0.73	0.76	0.22	-0.20	0.23
									1.00	0.40	0.80	-0.01	-0.05	0.12
										1.00	0.84	0.25	-0.30	0.09
											1.00	0.15	-0.23	0.11
												1.00	0.00	0.00
													1.00	-0.16
														1.00

TABLE 3

Intercorrelation Matrix

Class of 1973

Test	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Req. QPA	1.00	0.88	0.74	-0.42	0.00	-0.16	-0.05	-0.08	-0.03	-0.02	-0.08	0.17	0.10	0.01	0.07
2. Over. QPA		1.00	0.72	-0.42	0.03	-0.16	-0.01	-0.07	0.00	0.00	0.00	0.17	0.14	0.05	0.12
3. Degree			1.00	-0.16	0.39	0.24	0.22	0.27	0.35	0.25	0.22	0.45	0.37	0.32	0.41
4. Old TWS				1.00	-0.02	-0.07	-0.14	0.12	-0.05	-0.02	0.05	-0.03	0.02	-0.01	0.00
5. Acad. Avg.					1.00	0.09	0.64	0.73	0.83	0.78	0 59	0.69	0.59	0.76	0.81
6. Man. Avg.						1.00	0.26	0.06	0.20	0.04	-0.05	0.04	-0.02	-0.02	-0.04
7. Quant. Reas.							1.00	0.37	0.78	0.42	0.12	0.40	0.15	0.40	0.33
8. Verb. Reas.								1.00	0.83	0.52	0.42	0.35	0.39	0.42	0.50
9. Ment. Lev.									1.00	0.58	0.34	0.47	0.35	0.50	0.51
10. Read. Comp.										1.00	0.37	0.45	0.39	0.54	0.53
11. Biology											1.00	0.26	0.72	0.62	0.79
12. Chemistry												1.00	0.53	0.73	0.76
13. Fac. Sci.													1.00	0.40	0.80
14. Sci. App.														1.00	0.84
15. Total Sci.															1.00
16. Sp. Rel.															
17. Chalk															
18. New TWS															

TABLE 4

Intercorrelation Matrix

Class of 1974

3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
0.38	0.16	-0.04	0.18	0.06	0.13	0.08	0.15	0.19	0.18	0.21	0.25	-0.10	0.04	0.79
0.35	0.28	-0.07	0.29	0.22	0.28	0.12	0.22	0.20	0.27	0.23	0.29	-0.15	0.04	0.73
1.00	0.04	-0.10	-0.05	0.11	0.04	-0.03	0.15	-0.04	0.09	0.00	0.05	-0.01	-0.13	-0.02
	1.00	0.34	0.71	0.69	0.82	0.71	0.66	0.68	0.69	0.76	0.81	0.35	0.22	0.45
		1.00	0.32	0.09	0.26	0.26	0.31	0.26	0.27	0.32	0.34	0.85	0.79	0 19
			1.00	0.43	0.84	0.40	0.29	0.42	0.28	0.51	0.45	0.33	0.21	0.40
				1.00	0.82	0.44	0.44	0.28	0.40	0.38	0.46	0.09	0.06	0.28
					1.00	0.49	0.43	0.42	0.41	0.53	0.55	0.25	0.18	0.40
						1.00	0.39	0.32	0.32	0.44	0.42	0.27	0.18	0.19
							1.00	0.36	0.73	0.69	0.79	0.31	0.21	0.41
								1.00	0.72	0.78	0.82	0.26	0.19	0.42
									1.00	0.62	0.87	0.23	0.25	0.46
										1.00	0.89	0.37	0.17	0.47
											1.00	0.34	0.25	0.53
												1.00	0.39	0.14
													1.00	0.21
														1.00

TABLE 4

Intercorrelation Matrix

Class of 1974

Test	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Req. QPA	1.00	0.82	-0.38	0.16	-0.04	0.18	0.06	0.13	0.08	0.15	0.19	0.18	0.21	0.25
2. Over. QPA		1.00	-0.35	0.28	-0.07	0.29	0.22	0.28	0.12	0.22	0.20	0.27	0.23	0.29
3. Degree			1.00	0.04	-0.10	-0.05	0.11	0.04	-0.03	0.15	-0.04	0.09	0.00	0.05
4. Acad. Avg.				1.00	0.34	0.71	0.69	0.82	0.71	0.66	0.68	0.69	0.76	0.81
5. Man. Avg.					1.00	0.32	0.09	0.26	0.26	0.31	0.26	0.27	0.32	0.34
6. Quant. Reas.						1.00	0.43	0.84	0.40	0.29	0.42	0.28	0.51	0.45
7. Verb. Reas.							1.00	0.82	0.44	0.44	0.28	0.40	0.38	0.46
8. Ment. Lev.								1.00	0.49	0.43	0.42	0.41	0.53	0.55
9. Read. Comp.									1.00	0.39	0.32	0.32	0.44	0.42
10. Biology										1.00	0.36	0.73	0.69	0.79
11. Chemistry											1.00	0.72	0.78	0.82
12. Fac. Sci.												1.00	0.62	0.87
13. Sci. App.													1.00	0.89
14. Total Sci.														1.00
15. Sp. Rel.														
16. Chalk														
17. New TWS														

TABLE 5

Intercorrelation Matrix

Class of 1975

3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
-0.51	0.14	-0.03	0.15	-0.14	0.02	0.04	0.16	0.25	0.19	0.27	0.26	0.04	-0.07	0.79
-0.41	0.11	-0.07	0.20	-0.14	0.05	0.04	0.10	0.16	0.13	0.16	0.17	0.02	-0.11	0.73
1.00	-0.10	-0.07	-0.08	0.10	0.01	-0.11	-0.07	-0.22	-0.16	-0.18	-0.18	-0.05	-0.10	-0.14
	1.00	0.12	0.62	0.60	0.80	0.55	0.56	0.64	0.63	0.68	0.74	0.23	0.00	0.37
		1.00	0.08	0.00	0.07	0.14	0.08	0.06	0.01	0.14	0.10	0.80	0.80	0.27
			1.00	0.15	0.72	0.24	0.01	0.52	0.26	0.39	0.36	0.22	-0.04	0.32
				1.00	0.76	0.12	0.30	0.23	0.29	0.27	0.33	0.03	-0.05	0.03
					1.00	0.24	0.27	0.48	0.38	0.45	0.47	0.19	-0.05	0.25
						1.00	0.16	0.11	0.13	0.16	0.17	0.27	0.00	0.11
							1.00	0.30	0.73	0.62	0.77	0.08	0.06	0.32
								1.00	0.68	0.77	0.80	0.11	0.02	0.35
									1.00	0.58	0.87	0.02	0.00	0.31
										1.00	0.87	0.20	0.07	0.41
											1.00	0.13	0.06	0.42
												1.00	0.33	0.33
													1.00	0.14
														1.00

TABLE 5

Intercorrelation Matrix

Class of 1975

Test	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Req. QPA	1.00	0.88	-0.51	0.14	-0.03	0.15	-0.14	0.02	0.04	0.16	0.25	0.19	0.27	0.26
2. Over. QPA		1.00	-0.41	0.11	-0.07	0.20	-0.14	0.05	0.04	0.10	0.16	0.13	0.16	0.17
3. Degree			1.00	-0.10	-0.07	-0.08	0.10	0.01	-0.11	-0.07	-0.22	-0.16	-0.18	-0.18
4. Acad. Avg.				1.00	0.12	0.62	0.60	0.80	0.55	0.56	0.64	0.63	0.68	0.74
5. Man. Avg.					1.00	0.08	0.00	0.07	0.14	0.08	0.06	0.01	0.14	0.10
6. Quant. Reas.						1.00	0.15	0.72	0.24	0.07	0.52	0.26	0.39	0.36
7. Verb. Reas.							1.00	0.76	0.12	0.30	0.23	0.29	0.27	0.33
8. Ment. Lev.								1.00	0.24	0.27	0.48	0.38	0.45	0.47
9. Read. Comp.									1.00	0.16	0.11	0.13	0.16	0.17
10. Biology										1.00	0.30	0.73	0.62	0.77
11. Chemistry											1.00	0.68	0.77	0.80
12. Fac. Sci												1.00	0.58	0.87
13. Sci. App.													1.00	0.87
14. Total Sci.														1.00
15. Sp. Rel.														
16. Chalk														
17. New TWS														

TABLE 6

ROTATED FACTOR PATTERN
CLASS OF 1972

	Test	Factors I	II	III	IV	h^2
1.	Required QPA	05	95	-09	-09	92
2.	Overall QPA	06	89	-08	-13	82
3.	Old TWS	35	74	30	08	76
4.	"Degree"	02	-66	02	-19	47
5.	Academic Average	65	08	06	71	94
6.	Manual Average	03	01	98	10	98
7.	Quantitative Reasoning	-04	16	13	79	66
8.	Verbal Reasoning	27	-19	-13	72	64
9.	Mental Level	14	-02	03	92	88
10.	Reading Comprehension	34	04	05	52	39
11.	Biology	88	00	-01	00	77
12.	Chemistry	69	24	14	32	66
13.	Factual Science	86	-07	-07	06	75
14.	Science Application	74	29	16	28	74
15.	Total Science	95	13	05	20	96
16.	Spatial Relations	-01	00	67	43	63
17.	Chalk Carving	09	-03	79	-22	69

TABLE 7

ROTATED FACTOR PATTERNS
CLASS OF 1973

	Test	Factors I	II	III	IV	h^2
1.	Required QPA	03	94	-12	-09	91
2.	Overall QPA	08	92	12	-08	88
3.	Old TWS	35	81	-25	21	89
4.	"Degree"	14	-48	-06	-08	26
5.	Academic Average	60	04	01	77	94
6.	Manual Average	-04	-02	-97	18	98
7.	Quantitative Reasoning	-01	06	-14	84	73
8.	Verbal Reasoning	35	-06	04	68	59
9.	Mental Level	23	05	-07	90	87
10.	Reading Comprehension	41	00	04	61	54
11.	Biology	85	-11	04	13	76
12.	Chemistry	56	23	03	47	59
13.	Factual Science	88	09	-03	08	78
14.	Science Application	64	04	12	52	70
15.	Total Science	89	08	08	38	95
16.	Spatial Relations	-04	06	-58	49	59
17.	Chalk Carving	-05	-11	-78	-23	69
18.	"New" TWS	05	81	10	06	67

TABLE 8

ROTATED FACTOR PATTERNS
CLASS OF 1974

	Test	Factors I	II	III	IV	h^2
1.	Required QPA	16	93	-08	01	91
2.	Overall QPA	17	89	-14	18	87
3.	"Degree"	24	-56	-24	04	43
4.	Academic Average	61	08	15	74	95
5.	Manual Average	18	-01	96	13	97
6.	Quantitative Reasoning	16	21	24	77	72
7.	Verbal Reasoning	25	-01	-15	81	73
8.	Mental Level	25	11	09	92	93
9.	Reading Comprehension	26	-01	18	61	47
10.	Biology	76	02	13	26	67
11.	Chemistry	77	12	14	21	67
12.	Factual Science	88	09	09	16	82
13.	Science Application	79	11	17	34	78
14.	Total Science	91	13	15	31	73
15.	Spatial Relations	22	-13	80	16	73
16.	Chalk Carving	10	12	80	05	66
17.	"New" TWS	46	73	06	20	78

TABLE 9

ROTATED FACTOR PATTERNS
CLASS OF 1975

	Test	Factors I	II	III	IV	h^2
1.	Required QPA	13	95	-06	01	93
2.	Overall QPA	02	93	-11	06	88
3.	"Degree"	-13	-54	-06	06	32
4.	Academic Average	59	05	06	76	93
5.	Manual Average	04	02	99	07	98
6.	Quantitative Reasoning	12	22	02	77	66
7.	Verbal Reasoning	31	-31	-10	59	54
8.	Mental Level	30	-05	-03	89	88
9.	Reading Comprehension	02	05	17	51	29
10.	Biology	84	04	06	01	71
11.	Chemistry	69	21	01	37	65
12.	Factual Science	88	10	-05	14	81
13.	Science Application	79	19	11	29	76
14.	Total Science	94	17	05	24	97
15.	Spatial Relations	-02	11	79	30	72
16.	Chalk Carving	08	-05	83	-15	71
17.	"New" TWS	25	77	23	22	76

FIGURE 1

I Science Aptitude	II Achievement	III Manual Aptitude	IV General Ability
	CLASS OF '72		
Academic Average Biology Chemistry Factual Science Science Application Total Science	Required QPA Overall QPA Old TWS "Degree"	Manual Average Spatial Relations Chalk Carving	Academic Average Quantitative Reasoning Verbal Reasoning Mental Level Reading Comprehension
	CLASS OF '73		
Academic Average Biology Chemistry Factual Science Science Application Total Science	Required QPA Overall QPA Old TWS "Degree" "New" TWS	Manual Average Spatial Relations Chalk Carving	Academic Average Quantitative Reasoning Verbal Reasoning Mental Level Reading Comprehension Science Application
	CLASS OF '74		
Academic Average Biology Chemistry Factual Science Science Application Total Science	Required QPA Overall QPA "Degree" "New" TWS	Manual Average Spatial Relations Chalk Carving	Academic Average Quantitative Reasoning Verbal Reasoning Mental Level Reading Comprehension
	CLASS OF '75		
Academic Average Biology Chemistry Factual Science Science Application Total Science	Required QPA Overall QPA "Degree" "New" TWS	Manual Average Spatial Relations Chalk Carving	Academic Average Quantitative Reasoning Verbal Reasoning Mental Level Reading Comprehension